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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Mr. William F. Caton
Acting Secretary
Office of the Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20554

Notice of Proposed Rule Making
ET Docket No. 94-32

Dear Mr. Caton:

Please accept these initial comments on behalf of Fusion Systems Corporation (Fusion) in response to the Commission's Notice of Proposed Rule Making ("Notice") in ET Docket No. 94-32. Fusion reserves the right to file additional comments and materials in reply to other comments filed in this docket.

As an industry leader in design and production of industrial equipment using the 2450 MHz ISM frequencies, Fusion urges the Commission to proceed with the utmost caution as it evaluates competing proposals for the licensing of new services in the 2402 - 2417 MHz band. Fusion and other ISM equipment manufacturers have come to rely on the primary usage, accorded intentionally, for systems using the 2450 MHz band. Fusion has been investing substantial capital in ISM production technologies and successfully selling products on a worldwide basis that are energy efficient and pollution free. We believe, therefore, that any secondary usage in or around the 2450 MHz band must be able to withstand interference in-band, and must co-exist with ISM operations out of band. Because it is so difficult to predict the future environments and useful applications of ISM technologies, Fusion urges the Commission and the Department of Commerce to look elsewhere for new spectrum allocations for developing mobile and fixed service technologies.

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I. Fusion's Microwave Lamp Technology

Fusion began operations as an entrepreneurial start-up in 1971 to develop and market high power industrial ultraviolet lamp systems powered by microwave energy. In developing its products, Fusion relied upon and worked within established FCC and international requirements. In reliance upon these allocations, Fusion created a unique and valuable technology requiring the entire ISM bandwidth. Fusion has successfully manufactured and marketed these products in the U.S. and globally to a large number of important industries who themselves now rely upon this technology to keep their own production lines in operation. Today, Fusion is an \$80 million NASDAQ-traded company that sells a number of commercial products using 2450 MHz microwave-driven lamp systems in the 1500-6000 Watt range.

Fusion is the world leader in the production of microwave lamps, with an installed base worldwide in excess of 12,000 units. Fusion currently employs 350 people in its Maryland headquarters where all manufacturing takes place. Fusion's business is global, with approximately 50% of sales abroad, resulting in a net benefit to the U.S. trade balance. Fusion Japan, K.K. is a wholly-owned subsidiary located in Tokyo, and holds a significant market share in Japan. Fusion also has a European subsidiary based near London.

Fusion lamps are used in the production of such critical advanced products as semiconductor chips and optical fibers. Virtually all fiber-optic cable is made using microwave powered ultraviolet lamps for drying of protective coatings applied to the glass fibers. Advanced semiconductor integrated circuits are produced with microwave powered photostabilizer and asher equipment. Fusion lamp systems provide an ecologically preferable alternative to thermal ovens in numerous applications, providing non-polluting drying of industrial inks and coatings. An example is the drying of printing on some 2.5 billion Coors beverage cans annually. Fusion lamp systems are also used in the production of automobile glass and headlamps, no-wax floor tiles, and a wide variety of medical, electronic, packaging and other products. New applications involving ISM equipment, known as a microwave downstream ashers, are used in the semiconductor industry for photoresist cleaning.



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II. Fusion's Products Use the Entire 2450 MHz ISM Band

Fusion products depend critically on use of the full 100 MHz bandwidth and on the 2450 MHz center frequency. It was only through using the entire band that Fusion was able to make the breakthroughs necessary to overcome the prior limitations of microwave lamps.

Fusion uses commercial ISM magnetrons (Hitachi 2M130 and 2M131) developed for microwave ovens. These magnetrons experience small shifts of frequency as a function of load. When a microwave lamp starts operating, the load it presents to a magnetron must change significantly, thus forcing the frequency of the magnetron oscillation to shift. Depending on the system design, this shift can be 10-20 MHz.

In addition, Fusion's 10 inch long tubular lamps, of which over 8,000 are sold each year, use matched pairs of magnetrons which are separated by 30 MHz to prevent the magnetrons from phase locking with each other. Further, the frequency separation is necessary to allow rapid lamp start-up, a major competitive advantage of our microwave lamp technology compared to electrode arc lamps. The net result is that, when other factors, such as aging, are taken into effect, magnetrons can create interference at 2450 MHz \pm 40 MHz. For this reason the full \pm 50 MHz bandwidth is necessary for the proper design and function of these products.^{1/}

Fusion equipment sold in 1976 remains in service 24 hours a day in factories in the U.S. and abroad. Equipment being sold today will be in service well into the 21st century. This equipment is installed in such leading U.S. companies as AT&T, IBM, Motorola, Corning, Intel, Hewlett Packard, Coors, Ford, GM and many others.

^{1/} Fusion's lamps are designed in several length and cavity dimensions and are dependent on the frequency of the magnetron. One of our lamp systems, a six inch long unit, uses a single magnetron to couple energy to a bulb whose length is exactly one wavelength of the applied microwave energy, a design termed "resonant coupling." If the band were relocated by more than 15 MHz, then the length of lamp would have to be changed accordingly and all of our current installed lamps would be obsoleted. A significant shift of center frequency would require significant engineering investments to redesign the lamp and would result in an altered lamp and power density which would most probably be of no commercial value to our customers.



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III. FUSION CAUTIONS AGAINST USE OF THE 2450 MHz ISM BAND
FOR LICENSED SERVICES

Fusion urges the Commission to avoid allocating any of the 2450 MHz band to developing services that are not fully capable of co-existing on a secondary basis to ISM applications in both industrial and residential environments. Proposals, mentioned in the Notice, to use the 2402-2417 MHz band for such technologies as mobile satellite, wide area networking and even in-building voice and data would appear to be incompatible with widespread ISM applications. In addition, private radio proposals risk the real possibility of suffering unacceptable levels of interference from ISM equipment.

Despite the apparent willingness of prospective licensees to assume such risks, Fusion believes incompatibility with ISM applications can only lead to pressures on ISM manufacturers and users to limit their operation or reduce band requirements. Indeed, a preliminary proposal by the Commission to reallocate part of the 2450 MHz band at the 1992 WARC stimulated the ISM industry, for the first time, to point out the potentially harmful impact of such efforts. For these reasons, Fusion believes the better approach is for the Commission to leave the ISM band allocations as they exist and utilize other spectrum from the federal government for use by emerging technologies.

Very truly yours,

A handwritten signature in black ink, appearing to read "Leslie S. Levine". The signature is fluid and cursive, with a large initial "L" and a trailing flourish.

Leslie S. Levine
President and CEO
Fusion Systems Corporation